

What is claimed is:

- 1 1. A vacuum debris removal system for an integrated circuit manufacturing
2 device, comprising:
3 a plate;
4 an slit formed in the plate;
5 a pair of vacuum tubes, one disposed on each side of the slit; and
6 a single opening formed in each of the vacuum tubes at a selected
7 location.
- 1 2. The vacuum debris removal system of claim 1, wherein the selected location
2 of each single opening is at about a mid-point of the slit.
- 1 3. The vacuum debris removal system of claim 1, wherein the selected location
2 of each single opening is in a side of each vacuum tube facing the slit.
- 1 4. The vacuum debris removal system of claim 1, wherein each single opening
2 has a predetermined size and shape.
- 1 5. The vacuum debris removal system of claim 4, wherein each single opening
2 has a length of about 0.060 inches and a width of about 0.030 inches.
- 1 6. The vacuum debris removal system of claim 1, wherein the slit is
2 substantially rectangular and the pair of vacuum tubes extend substantially parallel
3 to each longest side of the slit to at least about a mid-point of the slit.
- 1 7. The vacuum debris removal system of claim 1, wherein the slit is elongate
2 and the vacuum tubes extend respectively parallel to each longest side of the slit.
1
- 2 8. The vacuum debris removal system of claim 1, wherein the selected location
3 of each opening causes air flow in the slit to a central location.

1 9. The vacuum debris removal system of claim 1, wherein the selected location
2 of each opening causes air flow in the slit away from an element of an integrated
3 circuit manufacturing device.

1 10. The vacuum debris removal system of claim 1, wherein the selected location
2 of the openings causes a maximum reduction of outgassed particles from a resist
3 material contaminating a lens element of an integrated circuit manufacturing device.

1 11. The vacuum debris removal system of claim 1, wherein the selected location
2 of the openings causes air flow in the slit for dual withdrawal of particles away from
3 an element of an integrated circuit manufacturing device.

1 12. The vacuum debris removal system of claim 1, wherein each vacuum tube of
2 the pair of vacuum tubes draws between about 3.5 and about 7 cubic feet per hour of
3 air.

1 13. A vacuum debris removal system for an integrated circuit manufacturing
2 device, comprising:
3 at least one vacuum tube; and
4 an opening formed in the at least one vacuum tube at a selected location
5 to cause air flow away from an element of the integrated circuit manufacturing
6 device.

1 14. The vacuum debris removal system of claim 13, wherein the opening has a
2 predetermined size and shape.

1 15. The vacuum debris removal system of claim 14, wherein the opening has a
2 length of about 0.060 inches and a width of about 0.030 inches.

1 16. The vacuum debris removal system of claim 13, wherein the selected
2 location of the opening causes a maximum reduction of outgassed particles from
3 contaminating a lens element of the integrated circuit manufacturing device.

1 17. The vacuum debris removal system of claim 13, wherein the selected
2 location of the opening is at a mid-point of an exposure slit of the integrated circuit
3 manufacturing device.

1 18. An apparatus for manufacturing a semiconductor device, comprising:
2 a stage to hold a semiconductor wafer during processing;
3 an exposure slit positioned relative to the stage;
4 projection optics to focus a light beam through the exposure slit and onto
5 a selected portion of the semiconductor wafer;
6 at least one vacuum tube adjacent the exposure slit; and
7 a single opening formed in the vacuum tube at a selected location to
8 cause air flow in the exposure slit away from a lens of the projection optics.

1 19. The apparatus of claim 18, wherein the selected location of the single
2 opening is at about a mid-point of the exposure slit.

1 20. The apparatus of claim 18, wherein the single opening has a predetermined
2 size and shape.

1 21. The apparatus of claim 18, further comprising
2 a second vacuum tube adjacent the exposure slit on an opposite side of
3 the exposure slit from the at least one vacuum tube; and
4 a single opening formed in the second vacuum tube at a selected
5 location.

1 22. The apparatus of claim 21, wherein the selected location of each single
2 opening is at about a mid-point of the exposure slit.

1 23. The apparatus of claim 21, wherein the selected location of the single
2 openings causes a maximum reduction of outgassed particles from contaminating
3 the lens.

1 24. A method of making a vacuum debris removal system, comprising:
2 providing at least one vacuum tube; and
3 forming a single opening in the at least one vacuum tube at a selected
4 location to cause air flow away from an element of an integrated circuit
5 manufacturing device.

1 25. The method of claim 24, further comprising forming the single opening to
2 have a predetermined size and shape.

1 26. The method of claim 24, further comprising selecting the location to form
2 the single opening to be at about a mid-point of an exposure slit of the integrated
3 circuit manufacturing device.

1 27. The method of claim 24, further comprising:
2 disposing the at least one vacuum tube on one side of an exposure slit of
3 the integrated circuit manufacturing device;
4 disposing a second vacuum tube on an opposite side of the exposure slit;
5 and
6 forming a single hole in the second vacuum tube to cause air flow in the
7 exposure slit away from the element of the integrated circuit manufacturing device.

1 28. A method of removing debris, comprising:
2 disposing at least one vacuum tube adjacent an exposure slit of an
3 integrated circuit manufacturing device; and
4 forming a single opening in the at least one vacuum tube at a selected
5 location.

1 29. The method of claim 28, further comprising forming the single opening to
2 have a predetermined size and shape.

1 30. The method of claim 28, further comprising selecting the location to form
2 the single opening to be at about a mid-point of the exposure slit.

1 31. The method of claim 28, further comprising:
2 disposing a second vacuum tube on an opposite side of the exposure slit
3 from the at one least vacuum tube; and
4 forming a single hole in the second vacuum tube to cause air flow in the
5 exposure slit away from a lens element of the integrated circuit manufacturing
6 device.